

CLAIMS

1. Apparatus for high speed grinding comprising a diamond bonded abrasive wheel, drive means for mounting and rotating the grinding wheel at peripheral speeds up to approximately 200 m/s, and a liquid coolant supply system including delivery means for directing liquid coolant to the point of grinding contact.
2. Apparatus as claimed in claim 1 wherein said delivery means is a nozzle arranged to direct a jet of liquid coolant at the point of grinding contact in a substantially tangential direction to the wheel.
3. Apparatus as claimed in claim 1, wherein delivery means is provided through the grinding wheel, which delivery means comprises a plurality of channels for connecting an interior chamber to the exterior surface of the grinding wheel.
4. Apparatus as claimed in claim 3 wherein the plurality of channels is provided by radial slots formed in the grinding wheel.
5. Apparatus as claimed in claim 3 or claim 4 wherein the liquid coolant is supplied to the chamber.
6. Apparatus as claimed in claim 5, wherein the liquid coolant supplied to the internal chamber is directed within the chamber by guide means towards the point of grinding contact.
7. Apparatus as claimed in any of claims 1 to 6 wherein there further comprises second nozzle to direct a jet of liquid coolant to the periphery of the wheel to clean the surface of the wheel.
8. Apparatus as claimed in any of claims 1 to 7 wherein the liquid coolant supply system in use, delivers liquid coolant to the chamber at a pressure of between 0 to 100 Bar.
9. Apparatus as claimed in claim 8 wherein the jet of liquid coolant is supplied to the second nozzle at a pressure in excess of 40 Bar.

10. Apparatus as claimed in claim 8 or claim 9 wherein the jet of liquid coolant to clean the wheel is directed at a point spaced from the contact zone.
11. Apparatus as claimed in claim 10 wherein the second nozzle means is arranged to direct a jet of liquid coolant away from the grinding contact in a substantially radial direction to the wheel.
12. Apparatus as claimed in any preceding claim wherein there further comprises a controller to control the rotational speed of the grinding wheel and select a contact zone to supply the liquid coolant.
13. Apparatus as claimed in any preceding claim wherein the grinding wheel is composed of diamond bonded abrasive wheel in either a resin, galvanic, vitrified or metal bonded construction.
14. Apparatus for high speed grinding comprising a multi-axis machining centre including an automatic tool changer and apparatus as claimed in any preceding claim.
15. Apparatus as claimed in claim 14 wherein the delivery means is moveable in response to a tool change operation.
16. A method of carrying out a grinding operation on a workpiece at a high material removal rate including the steps of (i) setting up the grinding wheel for a series of cuts of potentially different depths either "up cut" or "down cut" grinding; (ii) selecting the nozzle zone; (iii) setting up the apparatus to direct liquid coolant at the grinding contact point; and (iv) grinding the workpiece by rotating the grinding wheel at peripheral speeds in excess of 10 m/s.
17. A method as claimed in claim 16 further comprising the step of moving the table speed in excess of about 2 m per minute.
18. A controller for controlling high speed grinding apparatus as claimed in any of claims 1 to 11, which controller comprising a central processor, a manual input means and

separate means controlled by said central processor for controlling individually the liquid coolant supply to the delivery means at the point of grinding contact and/or to clean the grinding wheel.

19. A controller as claimed in claim 18 wherein the means for controlling the liquid coolant supply is a matrix of valves within the liquid coolant delivery system.
20. A control system for controlling the operation of an apparatus as claimed in any of claims 1 to 13 comprising the steps of (a) activating the liquid coolant supply; (b) selecting rotational speed of grinding wheel; (c) selecting the nozzle zone (d) activating grinding cycle; and (e) terminating the liquid coolant supply.